PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Padmanabhan et al.	
Serial No.:	09/656,694	
Filing Date:	September 7, 2000	**Group Art Unit:** 2832
Title:	ROBUST FLUID FLOW AND PROPERTY MICROSENSOR MADE OF OPTIMAL MATERIAL	**Examiner:** Easthom, Karl D.
Docket #:	9028/322 (H16-26318)	

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Janet Byrne

Janet Byrne

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

APPELLANT'S APPEAL BRIEF

Dear Sir:

In response to the Office communication dated February 10, 2004, Appellant appeals the rejections of Examiner Easthom.

(1) REAL PARTY IN INTEREST

The inventors of the present application—Aravind Padmanabhan, Ulrich Bonne, and Michael James Haji-Sheikh—were all employees of Honeywell International Inc., a Delaware corporation, at the time the invention was made and continue to be employed by Honeywell International Inc. Although a formal assignment relating to this application has not yet been executed, each of these employees is under an obligation to assign their rights to Honeywell International Inc.

(2) RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences related to the present case.

(3) STATUS OF CLAIMS

Claims 1, 4-18, 33, 34, and 35 are pending and are herein appealed. Claims 2 and 3 were previously cancelled, and claims 19-32 were previously withdrawn.

Claims 1, 4, 5, 8, 14, 33, and 35 have been rejected under 35 U.S.C. § 102(b) as being anticipated by *Strott et al.* (U.S. Patent 5,057,811).

Claims 1, 4, 8, 14, 33 and 35 have been rejected under 35 U.S.C. § 102(e) as being anticipated by *Mastromatteo et al.* (U.S. Patent 6,028,331).

Claims 1, 4-16, and 33-35 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Bertram* (U.S. Patent 4,085,398) in view of *Morimasa et al.* (U.S. Patent 5,804,720).

Claims 17 and 18 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Bertram* with *Morimasa*, further in view of *Gerblinger et al.* (U.S. Patent 5,430,428).

Claims 11, 12, and 34 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Bertram* with *Morimasa*, further in view of *Kushida et al.* (U.S. Patent 4,400,684).

(4) STATUS OF AMENDMENTS

No claim amendments were filed subsequent to the final rejection.

(5) SUMMARY OF INVENTION

The present invention generally provides for a physical property sensor. Appellant's claim 1 recites the sensor including: a substantially solid insulating sensor body with a plurality of openings extending through the sensor body (*see* Fig. 2, Specification, page 7, lines 10-16); a plurality of sensing elements coupled to the front surface of the sensor body including a thermal sensor and a heater (*see* Figs. 1, 2; Specification, page 6, lines 22-27); and a connection material filling the openings through the sensor body electrically connecting the sensing elements to a material on the back surface of the sensor (*see* Fig. 2, Specification, page 7, lines 10-16). The thermal conductivity of the sensor body is low enough to substantially prohibit heat transfer between the plurality of sensing elements, namely the thermal sensor and the heater, via the sensor body (*see* Specification,

page 4, lines 20-29). Additionally, the sensor body includes continuous solid material below the plurality of sensing elements.

Claims 4 and 5 recite the physical property sensor of the present invention wherein the sensing elements are specifically configured to include an environmental sensor or a second thermal sensor (*see* Figs. 1, 2; Specification, page 6, lines 22-27; page 14, lines 16-17), and claim 13 recites the sensor wherein the sensing elements are constructed of platinum coating on the front surface of the sensor body (*see* Specification, page 9, lines 12-15).

Claims 6-12 and 34 recite the physical property sensor of the present invention wherein the sensor body is made up of various materials (*see* Specification, page 5, lines 7-14, page 7, lines 22-27; page 15, line 3).

Claims 14-18 recite the physical property sensor of the present invention wherein the sensor body is made up of two materials, e.g. wherein one material is a plug positioned below the sensing elements and surrounded by the other material (*see* Fig. 4; Specification, page 10, line 24-page 11, line 13) or wherein one material is positioned directly below the sensing elements (*see* Fig. 5; Specification, page 11, line 14-page 12, line 5). Claims 14-18 further recite characteristics of the two materials, e.g. a cylindrical plug, a first material made of glass, and a second material made of alumina. *Id.*

(6) ISSUES

1) The Examiner rejected claims 1, 4, 5, 8, 14, 33, and 35 under 35 U.S.C. § 102(b) as being anticipated by *Strott et al.* (U.S. Patent 5,057,811). In making this rejection, has the Examiner established anticipation of the claimed invention?

2) The Examiner rejected claims 1, 4, 8, 14, 33 and 35 under 35 U.S.C. § 102(e) as being anticipated by *Mastromatteo et al.* (U.S. Patent 6,028,331). In making this rejection, has the Examiner established anticipation of the claimed invention?

3) The Examiner rejected claims 1, 4-16, and 33-35 under 35 U.S.C. § 103(a) as being unpatentable over *Bertram* (U.S. Patent 4,085,398) in view of *Morimasa et al.* (U.S. Patent 5,804,720). In making this multiple-patent obviousness rejection, has the Examiner made a *prima facie* case of obviousness?

4) The Examiner rejected claims 17 and 18 under 35 U.S.C. § 103(a) as being unpatentable over *Bertram* with *Morimasa*, further in view of *Gerblinger et al.* (U.S. Patent 5,430,428). In making this multiple-patent obviousness rejection, has the Examiner made a *prima facie* case of obviousness?

5) The Examiner rejected claims 11, 12, and 34 under 35 U.S.C. § 103(a) as being unpatentable over *Bertram* with *Morimasa*, further in view of *Kushida et al.* (U.S. Patent 4,400,684). In making this multiple-patent obviousness rejection, has the Examiner made a *prima facie* case of obviousness?

(7) GROUPING OF CLAIMS

All of claims 14-18 are separately patentable from claims 1, 4-13, and 33-36 because, even assuming *arguendo* that the latter are deemed anticipated or obvious in light of the prior art, the former include additional limitations that clearly differentiate themselves from the art of record as discussed herein. Additionally, claims 14 and 17 require a distinct configuration of the claimed "solid sensor body" from that of claims 15, 16, and 18, and, as discussed herein, the prior art does not speak to these two configurations equally.

Therefore, the claims on appeal do not stand or fall together. Generally, the claims can be organized into three groups, which are separately patentable from one another: (a) 1, 4-13, and 33-35, (b) 14 and 17, and (c) 15, 16, and 18.

Accordingly, Appellant proposes groupings for the claims on appeal as follows:

1) With respect to the rejection under 35 U.S.C. §102(b), Appellant proposes two groups: Group I includes claims 1, 4-5, 8, 33, and 35; Group II includes claim 14.

2) With respect to the rejection under 35 U.S.C. §102(e), Appellant proposes two groups: Group I includes claims 1, 4-5, 8, 33, and 35; Group II includes claim 14.

3) With respect to the first rejection under 35 U.S.C. §103(a) (*Betram* in view of *Morimasa*), Appellant proposes three groups: Group I includes claims 1, 4-13, and 33-35; Group II includes claim 14; Group III includes claims 15 and 16.

4) With respect to the second rejection under 35 U.S.C. §103(a) (*Betram* and *Morimasa*, in view of *Gerblinger*), Appellant proposes two groups: Group I includes claims 17; Group II includes claim 18.

5) With respect to the third rejection under 35 U.S.C. §103(a) (*Betram* and *Morimasa*, in view of *Kushida*), claims 11, 12, and 34 are grouped together.

(8) ARGUMENT

A. *Background*

The new configuration for a property sensor that is provided by the present application represents an improvement over the prior art and provides for a more robust sensor die. The sensor of the present invention includes, "a flat, passivated, top surface overlying...heater and sensor elements to provide appropriate electrical isolation...[T]he die, with its through-the-wafer interconnections, eliminates the need for bonding wires with their attended problems...In order to withstand a wide range or pressure levels and operate in harsh environments, the die structure is configured to be very robust." Specification, page. 4, lines 1-5. "Specifically, no wire bonds are extending upward from the upper surface of microsensor die 21. Consequently, there are no structures which interfere with the flow being sensed [and] this eliminates any turbulence, along with avoiding stresses on the particular bonding structures." Specification, page 7, lines 13-16. This invention is not taught or suggested by the prior art, and thus is patentable. The unique and novel configuration of this invention is further outlined below but has been presented to the Examiner through the prosecution of this application.

The present application was originally filed on September 7, 2000. The application is a continuation-in-part of U.S. Patent Application Serial No. 09/207,165, filed December 7, 1998, entitled "Rugged Fluid Flow and Property Microsensor," now U.S. Patent No. 6,184,773, and U.S. Patent Application Serial No. 09/368,621, filed August 5, 1999, entitled "Microsensor Housing," now U.S. Patent No. 6,322,247, which is a Continuation-in-Part of U.S. Patent Application Serial No. 09/239,125, filed January 28, 1999, entitled "Microsensor Housing," now U.S. Patent No. 6,361,206.

Examiner Easthom initially issued a restriction requirement that required an election of claims 1-18, 19-29, or 30-32, which was mailed on December 3, 2001. On December 12, 2001, Appellant responded by electing claims 1-18.

The first substantive Office Action addressing the merits of patentability was sent on May 29, 2002 (*see* paper number 8), at which time Examiner Easthom rejected claims 1-18 based on a combination of 35 U.S.C. § 112, paragraph 2, 35 U.S.C. § 102(b), and 35 U.S.C. § 103(a).

In Appellant's response to the May 29, 2002 Office Action, Appellant amended claims 1, 4, 5, and 12, submitted new claims 33 and 34, canceled claims 2 and 3, and set out detailed arguments directed towards the differences between the invention and the cited references in response to the Examiner's rejections.

In his November 19, 2002 Office Action (*see* paper number 11), Examiner Easthom issued a final rejection, essentially maintaining the previous grounds of rejection.

On May 19, 2003, Appellant filed a Request for Continued Examination under 37 CFR § 1.114 and an Amendment, which amended claim 1, added claim 35, and asserted additional arguments illustrating the differences between the claimed invention and the cited references.

On June 23, 2003, Examiner Easthom issued non-final Office Action (*see* paper 15). In that rejection, the 35 U.S.C. § 112 was removed and one of the previous 35 U.S.C. § 102(b) rejections (based on the *Bertram* reference) was removed. Additionally, Examiner maintained the other 35 U.S.C. § 102(b) rejection (based on the *Strott* reference), maintained the previous 35 U.S.C. § 103 rejections, and presented a new 35 U.S.C. § 102(e) rejection.

In response to the rejections of the June 23, 2003 Office Action, Appellant carefully distinguished the pending claims from the cited references. On February 10, 2004, Examiner issued a final Office Action, which maintained each of the previous claim rejections.

In response to the final rejection of February 10, 2004, Appellant filed a Notice of Appeal, which was received by the Office on May 12, 2004. Each of the Examiner's rejections will be addressed below.

B. *Rejection of Claims 1, 4, 5, 8, 14, 33, and 35 under 35 U.S.C. § 102(b): Strott*

Claims 1, 4, 5, 8, 14, 33, and 35 have been rejected under 35 U.S.C. § 102(b) as being anticipated by *Strott* et al. (U.S. Patent 5,057,811). Because each and every element of every claim is not taught by the reference as required by MPEP § 2131, the Examiner's § 102 rejections are unsupported by the art and should be withdrawn.

(i) Claim 1

The present invention generally provides for a physical property sensor, including the following elements (with element labels added for ease in identifying the recited elements):

(a) a substantially solid insulating sensor body having a front surface and a back surface, and the sensor body having a known thermal conductivity, wherein the sensor body has a plurality of openings extending from the front surface to the back surface;

(b) a plurality of independent sensing elements coupled to the front surface for monitoring the properties of a fluid, the plurality of independent sensing elements including at least one thermal sensor and at least one heater, wherein the thermal conductivity of the sensor body is low enough to substantially prohibit heat transfer between the plurality of independent sensing elements via the sensor body, and wherein the sensor body includes continuous solid material below the plurality of sensing elements thus providing for a more robust sensor die; and

(c) a connection material filling the plurality of openings such that the plurality of independent sensing elements are electrically connected to corresponding connection material on the back surface, and the connection material is configured to accommodate connection of the connection material to an electronics substrate.

Initially, *Strott* merely describes a temperature switch for use in power controllers to protect against thermal buildup in a power system. *Strott* does not describe physical property sensing. Rather, the device described in *Strott* includes an insulating layer 4 and electrically coupled thermistors 3, 12, 13 on the insulating layer. *See* Fig.1; Col. 4, line 23-Col. 5, line 6. By running a current across a nearby shunt 5, thermistor 3 is heated up relative to the other thermistors 12, 13. *See* Col. 5, lines 6-30; Figs. 1, 2. Measuring the temperature/resistance difference between thermistors allows for monitoring thermal buildup and determining when a predetermined level is exceeded. *Id.*

Accordingly, the switch of *Strott* merely measures a current and resistance via temperature differentials of thermistors. The switch cannot be used for "monitoring the properties of a fluid" as claimed in the present invention, and there is no teaching in *Strott* of how the sensing elements 3, 12, and 13 monitor fluid properties as claimed; the reference merely describes monitoring heat or current. *Richardson v. Suzuki Motor Co.* clearly requires that a reference in a 35 U.S.C. § 102 rejection show the "identical invention...in as complete detail as is contained in the...claim," which *Strott* does not. 868 F.2d 1226, 1236, 9 U.S.P.Q.2d 1913, 1920 (Fed.Cir.1990). Petitioners note that Examiner asserts, "Fluid flow can be sensed by such thermistors since fluid will cool the thermistors whose resistance will then change, sensing fluid." However, nowhere does *Strott* teach such fluid sensing. Additionally, this interpretation of *Strott* is incompatible with Examiner's position that layers 2 and 4 of *Strott* substantially prohibit heat transfer; if layers 2 and 4 substantially prohibit heat transfer as claimed, then fluid flow would not cool the thermistors as asserted by Examiner because the thermistors are sandwiched between layers 2 and 4. *See* Fig. 5.

Claim 1 further recites, "a plurality of independent sensing elements coupled to the front surface for monitoring the properties of a fluid, the plurality of independent sensing elements including at least one thermal sensor and at least one heater." Examiner's 35 U.S.C. § 102 (b) rejection relies on thermistors 3, 12, and 13 of *Strott* to disclose the claimed "plurality of independent sensing elements," including a heater and a thermal sensor. *See* final Office Action page 2. It is clearly an untenable position that three identical thermistors teach both a thermal sensor and a heater as claimed. Whereas thermistors have resistance that varies with temperature, *Strott* merely teaches a single type of element—a thermistor—rather than two separate types of elements as claimed, namely a thermal sensor and a heater. There is no disclosure in *Strott* that implies that the thermistors actually operate as both thermal sensors and heaters.

Moreover, the thermistors disclosed in *Strott* clearly do not teach "at least one heater" as claimed. Examiner asserts that thermistor 3 is a heater. *See* final Office Action page 2. However, under this logic, it is unclear how thermistor 12, and 13 are not also heaters. The only distinction between these thermistors taught by *Strott* is their size and positioning, but they all are formed of the same material and have equal resistance. *See* col. 4, lines 41-54. Although *Strott* teaches that thermistor 3 is heated when shunt 5 heats up, this teaching does not make thermistor 3 a "heater." *See* Col. 5, lines 6-30. Under this logic, any object that can be heated by being adjacent to a heat source is a "heater." The term "heater" would have no substantive meaning under this interpretation.

Claim 1 additionally recites "wherein the thermal conductivity of the sensor body is low enough to substantially prohibit heat transfer between the plurality of independent sensing elements via the sensor body." In stark contrast, nowhere does *Strott* teach a sensor body that has a thermal conductivity low enough to prohibit heat transfer therethrough. Specifically the § 102(b) rejection relies on the second layer 4 of *Strott* to teach the claimed "solid insulating sensor body." *See* final Office Action page 2. Although layers 2 and 4 of *Strott* are formed of glass, *see* Col. 4, lines 15-22 and lines 55-63, the entire functionality of *Strott* relies on the heat from shunt 5 transferring through these layers enough to heat thermistor 3. *See* Col. 5, lines 6-31. There is no additional discussion in *Strott* regarding heat transfer through layers 2 and 4. Thus, whereas *Richardson* requires for a proper § 102 rejection that, "The identical invention must be shown in as complete detail as is contained in the ... claim," *Strott* clearly does not show this aspect of the invention "in as complete detail" as claimed. For this additional reason, *Strott* fails to teach each and every element of the pending claims.

For at least these reasons, *Strott* clearly does not show each and every element of claims 1, 4, 5, 8, 14, 33, and 35 as required by MPEP § 2131. Accordingly, Petitioner respectfully requests that the Examiner's § 102 rejection as to these claims be withdrawn.

(ii) Claim 14

Claim 14 recites "the substantially solid sensor body is made up of a first material and a second material, wherein the first material is positioned directly below the plurality of sensing elements." *Strott* fails to teach this limitation.

Examiner states "In claim 14, there are at least two materials, [insulating layer] 2 and the nonoxidizing coating at col. 2, lines 25-32 which is also included as a material. Either one is below the sensing elements because the device can be flip mounted as noted above at col. 2, lines 28-32."

Claim 1, from which claim 14 depends, requires that "the sensor body includes continuous solid material below the plurality of sensing elements..." Claim 14 adds the further limitation that the sensor body—which is still required to be "below" the plurality of sensing elements—is made up of at least two materials. However, if the sensor of *Strott* is "flip mounted" as suggested by Examiner, thereby causing the nonoxidizing coating to be "below" the sensing elements 3, 12, and 13, then insulating layer 2 would clearly be "above" the sensing elements in contradiction to claim 1. Even assuming that the combination of the insulating layer 4 and the nonoxidizing coating of *Strott* disclose a sensor body with two materials, both "below" the sensing elements, *Strott* fails to teach a plurality of openings that extend from the front surface to the back surface of this "sensor body." Specifically, if the combination of the insulating layer 4 and the nonoxidizing coating disclose the sensor body with two materials recited in claim 14, these elements still clearly fail to include a sensor body with openings extending therethrough as recited in claim 1; nowhere does *Strott* teach any element or opening extending through the nonoxidizing coating, which is allegedly part of the "sensor body."

For this additional reason, *Strott* fails to teach each and every element of claim 14.

C. *Rejection of Claims 1, 4, 8, 14, 33 and 35 under 35 U.S.C. § 102(e): Mastromatteo*

Claims 1, 4, 8, 14, 33 and 35 have been rejected under 35 U.S.C. § 102(e) as being anticipated by *Mastromatteo* et al. (U.S. Patent 6,028,331). Because not every element of every claim is taught by the reference as required by MPEP § 2131, this rejection is unsupported by the art.

(i) Claim 1

Claim 1 recites "a plurality of independent sensing elements coupled to the front surface" of the sensor body, wherein the sensing elements include "at least one thermal sensor and at least one heater." Figures 12 and 13 of *Mastromatteo* show a cross-section of a wafer of semiconductor material in the final step of the manufacturing process. *Mastromatteo* discloses a heater 21 proximate to and supported by an intermetallic dielectric layer 15, the layer alleged to teach the sensor body of the present claimed invention. However, the other elements that are alleged to teach the remaining plurality of sensing elements—tin oxide film 24 and sensitive element 25—are not coupled to the front surface of layer 15 as is heater 21. The tin oxide film 24 and sensitive element 25 extend over heater 21 and connecting to contacting electrodes 22, thereby producing a connection with contact regions 14c. *See* Figs. 11 and 13; Col. 4, lines 46-53. The present claimed invention recites a plurality of sensing elements—including at least a thermal sensor and a heater—that are

both coupled to the front surface of the same sensor body. The heater 21 of *Mastromatteo* and the other sensing elements, 24 and 25, are not coupled to the front surface of the same element as claimed by the present invention.

Claim 1 further recites that "the sensor body includes continuous solid material below the plurality of sensing elements." In contrast, *Mastromatteo* states that "the sensitive element 25 and the heater 21 are supported by the dielectric layer 15 and are disposed above the air gap 26, which insulates them thermally from the regions underneath." Col. 4, lines 64-67 (emphasis added), *see, also*, Figs. 12 and 13 (showing the air gap beneath elements 21 and 25). By teaching an air gap below the heater 21 and sensitive element 25, *Mastromatteo* clearly fails to describe the "continuous solid material below the plurality of sensing elements" as claimed in the present invention. Examiner countered this previously-asserted argument by stating, "applicant contends air is below the sensor. If this were true it would be suspended in air which it is not. Body 15 is clearly below." *See* final Office Action page 5. This is a misstatement of Petitioner's argument. As clearly stated above, tin oxide film 24 and sensitive element 25 extend over heater 21 and connect to contacting electrodes 22; they clearly are not suspended in air. However, this configuration in *Mastromatteo* still requires that both sensitive element 25 and heater 21 are disposed above air gap 26. Claim 1, which recites a "continuous solid material below the plurality of sensing elements" clearly does not read on these sensing elements of *Mastromatteo* that are arranged above an air gap.

For at least these reasons, *Mastromatteo* fails to teach each and every element of claims 1, 4, 8, 14, 33 and 35 as required by MPEP § 2131.

(ii) Claim 14

As previously noted, claim 14 recites "the substantially solid sensor body is made up of a first material and a second material, wherein the first material is positioned directly below the plurality of sensing elements." *Mastromatteo* fails to teach this limitation, and nowhere does the § 102(e) rejection assert where the reference allegedly teaches this limitation of claim 14.

As described above, *Mastromatteo* describes a heater 21 supported by an intermetallic dielectric layer 15. However, there is no teaching of intermetallic dielectric layer 15 being made up of two materials as claimed.

For this additional reason, *Mastromatteo* fails to teach each and every element of claim 14.

D. *Rejection of Claims 1, 4-16, and 33-35 under 35 U.S.C. § 103(a): Bertram in view of Morimasa*

Claims 1, 4-16, and 33-35 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Bertram* (U.S. Patent 4,085,398) in view of *Morimasa et al.* (U.S. Patent 5,804,720). The cited references, either alone or in combination, do not teach or suggest all the claim limitations as required by MPEP § 2143, and the references are not properly combinable to teach the claimed invention as required by MPEP § 2143. Therefore, this rejection is unsupported by the art.

(i) Claim 1

(a) References Fail to Teach or Suggest Connection Material Filling the Plurality of Openings

Claims 1, 4-16, and 33-35 recite "a connection material filling the plurality of openings..." where the plurality of openings extend "from the front surface to the back surface" of the sensor body. *Bertram*, in contrast, fails to teach or suggest this limitation. Rather than filling holes 3, it is clear that plugs 4 only extend partially from the front surface of substrate 2 towards the back surface of substrate 2. *See*, Fig. 2 (showing open space in holes 3 that is not filled by a connection material). This result is logical because, reading *Bertram* as a whole, it is clear that the reference is concerned with connecting wires of different gauges; the different gauges account for the failing to fill holes 3. In other words, holes 3 are not filled with "a connection material" because *Bertram* teaches two elements—plug 4 and lead wire 5—to occupy holes 3, not a single "connection material" as claimed in the present invention.

Examiner countered this previously-asserted argument by stating, "The openings are filled by material 4, where the claim does not require the material to fill the openings from front to back, it only requires the openings to extend from front to back." *See* final Office Action page 6. Claim 1 clearly requires "the sensor body has a plurality of openings extending from the front surface to the back surface...and a connection material filling the plurality of openings." If "filling" the openings does not mean from front to the back, it is unclear what definition of "filling" Examiner is implementing. Stated differently, if a first element is "filled" merely when it contains any amount of a second element, the term "filled" has lost any substantive meaning. Clearly a limitation that requires the "filling" of openings does not read on *Bertram*, which plainly shows open space in holes 3.

The Examiner further countered, "As an alternative, Bertram discloses a tight fitting plug at the top of col. 3 to ensure that the lead wire is secured. It would have been obvious to have the hole completely filled in order to make an even stronger ensured connection where more material is obviously stronger than less." *See* final Office Action page 6. As previously described, the open

space in hole 3 of *Bertram* is the result of connecting wires of different gauges. However, there is no suggestion that the connection of these wires is not sufficiently strong such that it would require more material, nor is there any motivation in the cited references that would cause one to add more material for any other reason.

Morimasa also does not teach these limitations nor does it suggest modifying *Bertram* to teach these limitations. Specifically, *Morimasa* describes resistors 8-10, which are formed on bridge 7, and electrodes 12, which are formed at the end of resistors 8-10 and are the only electrical connection to resistors 8-10. *See* Col. 2, lines 61-64; Figs. 3 and 4. Nothing in *Morimasa* teaches or suggests electrically connecting the plurality of independent sensing elements with a connection material filling a plurality of openings that extend from the front surface of a sensor body to a back surface of a sensor body. Indeed, the only electrical connections to resistors 8-10, namely electrodes 12, lead away from the resistors along the two-dimensional plane of insulation layer 6 or protection layer 11; electrodes 12 clearly do not fill openings that extend from a front side to a back side of flow sensor 1. *See*, Figs. 3 and 4. Accordingly, there is nothing in the description of *Morimasa* that would teach or suggest modifying *Bertram* to include a connection material that fills the plurality of openings as claimed in the present invention.

For at least these reasons, *Bertram* and *Morimasa* fail to establish a *prima facie* case of obviousness for claims 1, 4-16, and 33-35 as described by MPEP § 2143.

(b) References Fail to Teach or Suggest a Continuous Material Below the Plurality of Sensing Elements

Claims 1, 4-16, and 33-35 further recite a "substantially solid insulating sensor body...wherein the sensor body includes continuous solid material below the plurality of sensing elements." The references fail to properly teach or suggest this limitation. The *Morimasa* reference clearly teaches a hollow 4 below resistors 8-10, and not a "continuous solid material." *See*, Col. 2, lines 41-64; Fig. 4. Moreover, *Bertram* and *Morimasa* are not properly combinable to teach or suggest this limitation because the hollow 4 of *Morimasa* is integral to the objectives sought to be obtained by the *Morimasa* reference. *See*, Col. 1, lines 51-59. Those objectives would be destroyed by an attempt to incorporate any teaching of *Bertram* that would interfere with *Morimasa*'s hollow. As noted by MPEP § 2143.01, "If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious."

Even assuming *arguendo* that that the "continuous solid material below the plurality of sensing elements" is taught by *Bertram*, the reference still fails to teach or suggest the "plurality of independent sensing elements" above the "continuous solid material," as claimed in the present invention. Examiner asserts that the claimed invention is disclosed by *Bertram* "except the heater and two thermal sensors..." The Examiner goes on to assert that these missing elements are disclosed by *Morimasa*: "The noted arrangement is disclosed at Fig. 4 of *Morimasa* with sensors 9, 10, and heater 8..." *See* final Office Action page 3. Petitioner respectfully disagrees with Examiner that these references can be combined so as to incorporate the heater 8 and the sensors 9 and 10 (resistors 8-10) from *Morimasa* into the *Bertram* reference.

The resistors 8-10 of *Morimasa* are described by the reference as requiring a hollow 4 below the resistors to achieve the benefits of the disclosure therein. *See*, Col. 1, lines 51-59; Col. 2, lines 41-64; Col. 3, lines 18-23; Fig. 4. It would therefore be impracticable—and accordingly one skilled in the art would not be motivated to attempt—to modify *Bertram* to incorporate the resistors 8-10 of *Morimasa*. *See*, MPEP § 2141.02 (noting that "A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention.").

Whereas *Bertram* includes solid substrate 2 and plugs 4 directly below the sensing end of the detector, resistors 8-10 from *Morimasa* require a hollow directly therebelow. Further, the electrical connection to the sensing end of the detector of *Bertram* is plug 4, which extends directly downward from the sensing end; if a hollow were created at the sensing end of the detector of *Bertram* to accommodate for the resistors 8-10 of *Morimasa*, the hollow would be directly below resistors 8-10, thereby leaving no place for plugs 4 to connect to the resistors.

For these additional reasons, *Bertram* and *Morimasa* fail to establish a *prima facie* case of obviousness for claims 1, 4-16, and 33-35 as described by MPEP § 2143.

(ii) Claims 14 and 15

Claims 14 and 15 further recite that the sensor body "is made up of a first material and a second material, wherein the first material is positioned directly below the plurality of sensing elements" or that the sensor body "includes a plug made of a first material positioned below the plurality of sensing elements, the plug being surrounded by a second material which makes up the remainder of the substantially solid sensor body." Claims 14 and 15 also inherit from claim 1 the limitation that the plurality of independent sensing elements are "coupled to the front surface" of the sensor body. Thus, even if a sensor body is made up of two materials as recited in claims 14 and 15, claim 1 still requires the sensing elements to be coupled to the front surface thereof.

The Examiner asserts several arguments to support the view that *Bertram* teaches the limitations of claims 14-15. Petitioner respectfully disagrees that *Bertram* and *Morimasa*, each alone or in combination, teach or suggest a substantially solid insulating sensor body that is made up of or includes first and second materials as recited by claims 14-15.

The Examiner first asserts that, "In claims 14-16, col. 2, lines 1-5 [of *Bertram*] discloses more than two plugs 4 and holes." *See* final Office Action page 4. The plugs 4 of *Bertram* are not part of the substrate 2 and, therefore, cannot teach or suggest a second material of the substrate. Rather, the plugs 4 are electrically connected to film 8. If it is necessary to interpret these plugs as part of the substrate—rather than the connection material that is electrically connected to the plurality of independent sensing elements of the present invention as recited in claim 1—in order to disclose the elements of claims 14 and 15, then *Bertram* clearly fails to teach the connection material claimed by the present invention. Moreover, the present invention recites "a substantially solid insulating sensor body." Plugs 4 cannot teach one of the materials of the insulating sensor body to satisfy claims 14 and 15 because the material of plugs 4 is clearly not insulating; plugs 4 are metal and conducting and take up a substantial portion of substrate 2. *See*, Col. 2, lines 5-7. For at least these reasons, the plugs 4 do not teach or suggest a second material of the sensor body as suggested by Examiner.

The Examiner further asserts, "Or in claim 14, the insulator 10 and substrate 2 [of *Bertram*] meet the claim as a second and first material, with the first material 2 below the sensing elements." *See* final Office Action page 4. As suggested by the Examiner, substrate 2 of *Bertram* is below the "sensing elements" of *Bertram*, namely thin film 8. However, if deposited film 10 of electrical insulation material is considered to teach part of the "sensor body" of the present claimed invention as suggested by Examiner in order to satisfy claim 14, then the sensing elements would not be "coupled to the front surface" of the sensor body as claimed. *See*, Fig. 2 (clearly showing sensing film 8 sandwiched between substrate 2 and deposited film 10). Rather, the sensing elements would be above one material of the sensor body (substrate 2) and below the other material of the sensor body (deposited film 10). Nor would there be any motivation to modify *Bertram* to arrange deposited film 10 below sensing film 8; the very reason for deposited film 10 is protect the sensing film 8, which only works if sensing film 8 is arranged between substrate 2 and film 10. *See*, Col. 3, lines 16-18.

The Examiner also asserts, "Or as another alternative to claims 14-16, the insulator 10 [of *Bertram*] is a first material plug, which is depicted as substantially cylindrical within the vias in Fig. 2, thus below the sensing film 8." *See* final Office Action page 4. Firstly, film 10 is not depicted as

being within the vias of *Bertram*. *See*, Fig. 2 (showing film 10 above holes 3; meniscus 6 is concavely arranged into plugs 4), *see*, *also*, Col. 2, lines 19-27, Col. 3, lines 16-18 (describing meniscus 6 is concavely arranged into plugs 4 and film 10 over film 8). Further, for the same reasons stated above, considering the deposited film 10 as being one of the materials that make up the sensor body fails to teach or suggest the present claimed invention; if film 10 is part of the sensor body along with substrate 2, the sensing elements 8 would be inside the sensor body, not "coupled to the front surface" thereof. As described above, film 10 only protects film 8 as taught by *Bertram* if sensing film 8 is arranged between substrate 2 and film 10. Film 8 would not be "coupled to the front surface" of the sensor body as claimed if the sensor body includes both substrate 2 and film 10.

The Examiner finally asserts, "Or, the insulator 10 is below the sensing elements when the device is upside down, such as happens during shipping or handling." *See* final Office Action page 4. If element 10 of *Bertram* is considered to be part of the sensor body and is considered to be below the sensing elements because the device is upside down, then the remainder of the sensor body, substrate 2, would then be above the sensing elements and the sensing elements would be sandwiched therebetween. This arrangement still fails to teach or suggest the present claimed invention for the same reasons discussed above, namely the sensing elements would not be "coupled to the front surface" of the sensor body and the sensor body (in part, substrate 2) would not be a continuous solid material below the sensing elements when the device is upside down.

Moreover, there is nothing in *Morimasa* that teaches or suggests modifying *Bertram* to include a sensor body that "is made up of a first material and a second material, wherein the first material is positioned directly below the plurality of sensing elements" or a sensor body that "includes a plug made of a first material positioned below the plurality of sensing elements, the plug being surrounded by a second material which makes up the remainder of the substantially solid sensor body." To the contrary, *Morimasa* clearly teaches forming a hollow 4 below the sensing elements, not a sensor body of two materials.

For these additional reasons, *Bertram* and *Morimasa* fail to establish a *prima facie* case of obviousness for claims 14-15 as described by MPEP § 2143.

E. *Rejection of Claims 17 and 18 under 35 U.S.C. § 103(a): Bertram and Morimasa, in view of Gerblinger*

Claims 17 and 18 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Bertram* with *Morimasa*, further in view of *Gerblinger et al.* (U.S. Patent 5,430,428). Appellant respectfully opposes these rejections. Because the cited references alone or in combination fail to

teach or suggest all of the claim limitations as required by MPEP §2143, Appellant respectfully requests that the Examiner's §103 rejection as to claims 17 and 18 be withdrawn.

As shown above, the combination of *Bertram* and *Morimasa* fails to teach or suggest a sensor body made up of a first material and a second material (claim 14) or a sensor body that includes a plug made of a first material and being surrounded by a second material which makes up the remainder of the sensor body (claim 15). Claims 17 and 18 depend from claims 14 and 15 respectively and, therefore, also include these limitations. Moreover, *Gerblinger* fails to teach or suggest these limitations or teach or suggest modifying *Bertram* and *Morimasa* to include these limitations.

For at least these reasons, the cited references do not, alone or in combination, teach or suggest all of the claim limitations of claims 17 and 18.

F. *Rejection of Claims 11, 12, and 34 under 35 U.S.C. § 103(a) Bertram and Morimasa, in view of Kushida*

Claims 11, 12, and 34 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Bertram* with *Morimasa*, further in view of *Kushida et al.* (U.S. Patent 4,400,684). Appellant respectfully opposes this rejection. Because the cited references alone or in combination fail to teach or suggest all of the claim limitations as required by MPEP §2143, Appellant respectfully requests that the Examiner's §103 rejection as to claims 11, 12, and 34 be withdrawn.

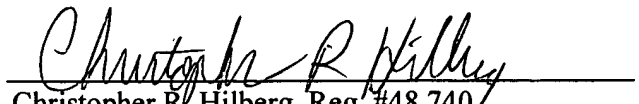
Claims 11, 12, and 34 depend from claim 1, and as shown above, the combination of *Bertram* and *Morimasa* fails to teach or suggest all of the claim limitations of claim 1—such as a connection material filling the plurality of openings and a substantially solid insulating sensor body below the plurality of sensing elements. Because *Kushida* does not teach or suggest modifying *Bertram* and *Morimasa* to include the missing limitations, combining *Kushida* with *Bertram* and *Morimasa* also fails to teach all of the claim limitations. Accordingly, the cited references do not, alone or in combination, teach or suggest all of the claim limitations of claims 11, 12, and 34.

(9) CONCLUSION

Pending claims 1, 4-18, 33, 34, and 35 remain variously rejected under 35 U.S.C. §§102(b), 102(e), and 103(a) as being unpatentable over assorted references. Appellant respectfully disagrees with the Examiner on this matter and request that the Board of Patent Appeals and Interferences reverse the Examiner's decision.

Should any additional fees be necessary, the Commissioner is hereby authorized to charge or credit any such fees or overpayment to Deposit Account No. 50-1901 (Reference #9028-322).

Respectfully submitted,

By 

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Attachment: Appendix (Claims Subject to Appeal)

Claims Subject to Appeal

1. A physical property sensor die, comprising:

a substantially solid insulating sensor body having a front surface and a back surface, and the sensor body having a known thermal conductivity, wherein the sensor body has a plurality of openings extending from the front surface to the back surface;

a plurality of independent sensing elements coupled to the front surface for monitoring the properties of a fluid, the plurality of independent sensing elements including at least one thermal sensor and at least one heater, wherein the thermal conductivity of the sensor body is low enough to substantially prohibit heat transfer between the plurality of independent sensing elements via the sensor body, and wherein the sensor body includes continuous solid material below the plurality of sensing elements thus providing for a more robust sensor die; and

a connection material filling the plurality of openings such that the plurality of independent sensing elements are electrically connected to corresponding connection material on the back surface, and the connection material is configured to accommodate connection of the connection material to an electronics substrate.

4. The physical property sensor die of claim 1 wherein the plurality of sensing elements include an environmental sensor.

5. The physical property sensor die of claim 1 wherein the plurality of sensing elements include at least a second thermal sensor.

6. The physical property sensor die of claim 1 wherein the sensor body is made up of a photosensitive glass.

7. The physical property sensor die of claim 1 wherein the sensor body is made up of a ceramic.

8. The physical property sensor die of claim 1 wherein the sensor body is made up of a highly melting glass.

9. The physical property sensor of claim 1 wherein the sensor body is highly insulating silicon.

10. The physical property sensor die of claim 7 wherein the ceramic is alumina.

11. The physical property sensor die of claim 8 wherein the ceramic is highly melting glass is fused silica.

12. The physical property sensor die of claim 6 wherein the photosensitive glass is FOTURAN.

13. The physical property sensor die of claim 1 wherein the plurality of sensing elements are constructed of platinum coated on the front surface.

14. The physical property sensor die of claim 1 wherein the substantially solid sensor body is made up of a first material and a second material, wherein the first material is positioned directly below the plurality of sensing elements.

15. The physical property sensor die of claim 1 wherein the substantially solid sensor body includes a plug made of a first material positioned below the plurality of sensing elements, the plug being surrounded by a second material which makes up the remainder of the substantially solid sensor body.

16. The physical property sensor die of claim 15 wherein the plug is substantially cylindrical.

17. The physical property sensor die of claim 14 wherein the first material is glass and the second material is alumina.

18. The physical property sensor die of claim 15 wherein the first material is glass and the second material is alumina.

33. The physical property sensor of claim 1 wherein the sensor body has a low thermal conductivity.

34. The physical property sensor of claim 1 wherein the sensor body is made up of PYREX.

35. The physical property sensor die of claim 1 wherein the sensor body and the connection material have a substantially similar coefficient of thermal expansion.